ABSTRACT

Micro-structured optical fibres are improved with respect to increasing the dispersion, both to large negative or large positive values, in a first fibre design in which the fibre has a micro-structured core region being surrounded by a micro-structured cladding region with cladding features being large compared to a predetermined wavelength of light, which can be guided through the fibre. Preferably, the effective index of refraction of the core region, N_{co}, is larger than the effective index of refraction of the cladding region, N_{cl}, at the predetermined wavelength of light. It is further preferred that the refractive index of one or more of the core features is lower than the refractive index of the core material. Increased dispersion is also obtained by a second optical fibre design in which the fibre has two cladding regions, where the inner cladding region may be micro-structured with inner cladding features and having an effective refractive index that is larger than the effective refractive index of the outer cladding region at the operating wavelengths, i.e. the fibre has an inner cladding with a raised effective refractive index. For the second fibre design it is preferred that the outer cladding region is micro-structured with outer cladding features. There is further provided a third optical fibre design, which may be used for non-linear applications, and in which the use of a raised, inner cladding provides the flexibility to obtain fibres with very, small cores and near-zero dispersion over a broad wavelengths range at near-infrared wavelengths. In the third fibre design, the optical fibre has a core region surrounded by an inner cladding region with a number of inner cladding features disposed in an inner cladding material, while the inner cladding region is surrounded by an outer cladding region. In the third design the inner cladding features have a refractive index that differs from the refractive index of the inner cladding material, and the inner cladding region has an effective refractive index N_i that is larger than the effective refractive index N_o of the outer cladding region at the operating wavelength. The core

region of the third design may be a substantially solid core with an effective refractive index N_{co} being larger than N_i at the operating wavelength. For the third design, the outer cladding region may also comprise a number of outer cladding features disposed in an outer cladding material, with the outer cladding features having a refractive index that differs from the refractive index of the outer cladding material. For the third fibre design it is preferred that the effective refractive index difference between the core region and the inner cladding region is greater than about 5%.